PATENT APPLICATION

IN THE U.S. PATENT AND TRADEMARK OFFICE

Appellants:	Lukas TROSMAN, et al.
Application No.:	10/748,174
Art Unit:	3663
Filed:	December 31, 2003
Examiner:	Alexandra F. AWAI
For:	DISTRIBUTED CLUMPING OF PART-LENGTH FUEL RODS FOR A REACTOR FUEL BUNDLE
Atty Dkt No.:	24GA127099 (HDP Ref.: 8564-000031/US)
Conf. No.:	5555

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October 22, 2007

APPELLANTS' BRIEF ON APPEAL UNDER 37 C.F.R. §41.37

Sir:

This is an Appeal Brief in response to the Office Action mailed December 20, 2006, of Claims 24, 26-29 and 31-33. A Notice of Appeal from this Rejection was timely filed on June 20, 2007. Concurrently, but separately filed, is a transmittal letter that encloses a check for the requisite governmental fee for the filing of an Appeal Brief. Appellants submit herewith their Brief on Appeal as required by 37 C.F.R. §41.37 along with the appropriate governmental fees as required by 37 C.F.R. §41.20(b)(2).

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BRIEF ON BEHALF OF APPELLANTS

Appellants hereby provide the following remarks in support of the Notice of Appeal filed on June 20, 2007, appealing the Examiner's final rejection of claims 24, 26-29 and 31-33 of the present application in the Office Action mailed on December 20, 2006. A listing of the appealed claims 24, 26-29 and 31-33 is provided in the *Claims Appendix*.

I. REAL PARTY IN INTEREST:

The real party in interest is Global Nuclear Fuel-Americas, LLC as evidenced by the Assignment recorded at Reel 014854 and Frame 0816.

II. RELATED APPEALS AND INTERFERENCES:

A related Appeal is pending in Application Ser. No. 10/748,175. The Notice of Appeal was filed May 15, 2006, while the Appellant's Appeal Brief and the Examiner's Answer to Appeal Brief have also been filed, at this time. The related Appeal may have bearing on the Board's decision in this Appeal.

III. STATUS OF CLAIMS:

Claims 24, 26-29 and 31-33 are pending in the application, with claims 24, 28 and 31 being in independent form. Claims 1-23, 25 and 30 have been previously cancelled. Each of claims 24, 26-29 and 31-33 remain finally rejected and are being appealed.

The Examiner has indicated correctly, in the December 20, 2006 Office Action, that claims 31-33 are directed to the previously non-elected Group II embodiment, as determined by the Restriction / Election Requirement dated July 16, 2004. Claims 31-33 had been inadvertently added back into the application during Appellants' February 7, 2006

Amendment, and since that time claims 31-33 have been examined on several occasions while being indicated as "rejected" in the Examiner's Office Action dated April 20, 2006, the Examiner's Advisory Action dated August 24, 2006, and the Examiner's Office Action dated December 20, 2006. While the addition of these claims was an oversight, it is the Appellants' understanding that the Examiner is now addressing these claims as if they were a part of the elected embodiment, as it is the Appellants' belief that the Examiner cannot now state that it would be an undue burden to further examine claims 31-33.

1. Claims 24 and 26-29 are rejected under 35 U.S.C. §103(a) as being unpatentable over Orii et al. ("Orii"), and further in view of Ueda et al. ("Ueda") and Johansson et al. ("Johansson");
2. Claims 31-33 are rejected under 35 U.S.C. §103(a) as being unpatentable over Orii et al. ("Orii") and Johansson et al. ("Johansson").

Claims 24, 26-29 and 31-33 are being appealed.

IV. STATUS OF AMENDMENTS:

An amendment after filing a Notice of Appeal under 37 C.F. R. §41.33 was filed August 10, 2006, and entered by the Examiner. The amendment was made to claims 24, 26, 28, 29 and 32 to comply with requirements of form expressly set forth by the Examiner on pages 3 and 4 of the Final Office Action mailed April 20, 2006, and to cancel claim 25 to reduce issues for Appeal.

The Claims Appendix reflects claims 24, 26-29 and 31-33 as amended in the August 10, 2006 submittal.

V. SUMMARY OF CLAIMED SUBJECT MATTER:

The following explains the subject matter set forth in each claim argued on appeal by way of example embodiments in the specification by page and line number, and in the drawings, if any, by reference characters only to satisfy 37 C.F.R. §41.37(c)(1)(v). This concise explanation relies on example embodiments from the specification to describe the claims; however, the claims recite subject matter not limited to these example embodiments. Independent claims 24, 28 and 31 are argued on appeal and discussed below.

Independent Claim 24

Example embodiments of the present invention are related to a fuel rod configuration for a fuel bundle including both part-length and full-length fuel rods. The embodiments provide an extra water volume near the full-length rods, in the voids above the part-length rods, in order to increase neutron absorption (i.e., "trap" extra neutrons) and prevent inadvertent reactor criticality in order to ultimately increase shut-down margin.

Claim 24 recites "A fuel bundle for a boiling water reactor". As described in paragraphs [0016] and [0018], an elevation view of a fuel bundle 10 is shown in FIG. 1, and a cross-sectional view of a fuel bundle 10 is depicted in FIG. 2.

Claim 24 further recites "a generally square, hollow tube having four sides which are configured as sides of the bundle". As described in paragraph [0018], FIG. 2 depicts the square shape of the bundle 10, with four sides 34 of the bundle 10.

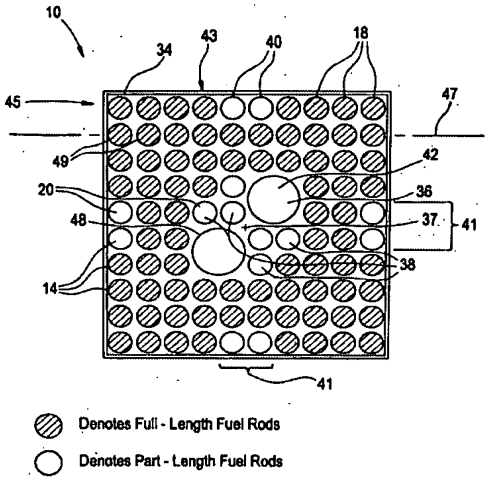
Claim 24 further recites "a pair of circular-shaped water passages located adjacent to a longitudinal centerline of the tube so as to extend centrally through the tube, the pair of water passages supported by one or more rod supports". As described in paragraph [0020], circularly-shaped water passages 36 are adjacent to the centerline 37 of FIG. 2. As described in paragraph [0016], the water passages 36 are supported by rod supports 22, 24, 26 shown in FIG. 1.

Claim 24 further recites "a plurality of fuel rods arranged in a 10x10 matrix and including full-length rods and part-length rods, the part-length rods further comprising". As described in paragraph [0016], fuel rods 18, 20 are arranged in a 10x10 matrix (FIG. 2) and include full-length rods 18 and part-length rods 20.

Claim 24 further recites "a first part-length rod group including two subsets in a mirror-image relationship along the centerline between the two water passages, each subset further comprising three part-length fuel rods in a triangular orientation with one rod of the subset closer to the longitudinal centerline between the two water passages than the other two rods of the subset and directly adjacent to the other two rods of the subset". As described in paragraph [0019], FIG. 2 depicts first part-length rods in two subsets 38 between the water passages 36 with one rod of each subset (see the two center-most rods 38 in between the water passages 36) closer to the longitudinal centerline 37.

Claim 24 further recites "a second part-length rod group including four pairs of part-length rods, each part-length rod pair centrally located in the outermost row or column of the 10x10 matrix adjacent a corresponding one of the four sides of the tube". As described in paragraph [0019], a second part-length rod group of four pairs of part-length rods 41 are centrally located in the outermost rows or columns 45 adjacent to the sides 34 of the bundle 10.

FIG. 2



Independent Claim 28

Claim 28 recites "A fuel bundle for a boiling water reactor". As described in paragraph [0016] and [0018], An elevation view of a fuel bundle 10 is shown in FIG. 1, and a cross-sectional view of a fuel bundle 10 is depicted in FIG. 2.

Claim 28 further recites "a pair of centrally located, circular-shaped water passages arranged on either side of a longitudinal centerline of the bundle within a 10X10 fuel-rod matrix bounded by four sides of a generally square, hollow tube, the fuel rods including full-

length and part-length fuel rods". As described in paragraph [0018], a pair of circular-shaped water passages 36 are depicted in FIG. 2 arranged around a centerline 37 of a generally square tube 10 with full-length 18 and part-length 20 rods.

Claim 28 further recites "wherein the 10X10 fuel-rod matrix includes two 3-rod subsets consisting of part-length rods in a mirror image relationship with one another along the longitudinal centerline between the two water passages, each 3-rod subset configured in a triangular orientation and directly adjacent to the pair of water passages such that one rod of the 3-rod subset is closer to the centerline than the other two rods and directly adjacent to the other two rods, and comprising eight additional part-length rods arranged in four pairs, each pair centrally located on an outermost row or column of the matrix nearest a corresponding one of the tube sides". As described in paragraph [0019], the 3-rod subsets 38 of part-length rods 20 along a centerline 37 are between water passages 36, with one rod (see the two center-most rods 38 in between the water passages 36) of the 3-rod subset 38 closer to the centerline 37. As described in paragraph [0019], the eight additional part-length rods 20 are arranged in pairs 41 which are centrally located on the outermost rows or columns 45 near the tube sides 34.

As described in paragraph [0020], The arrangement in FIG. 2, (as recited in either claims 24 or 28) may potentially increase an overall neutron absorption rate using the two part-length rod groups in the particular orientation. This may provide improved shutdown margin for a boiling water reactor including such a fuel assembly arrangement. In one example, the improved shutdown margin may result by locally increasing the size of the water traps or voids that are above the part-length fuel rods, by pairing or grouping these fuel rods together as shown in FIG. 2 along the outermost ring of periphery of the fuel bundle and in a facing mirror image relationship adjacent the two water passages 36.

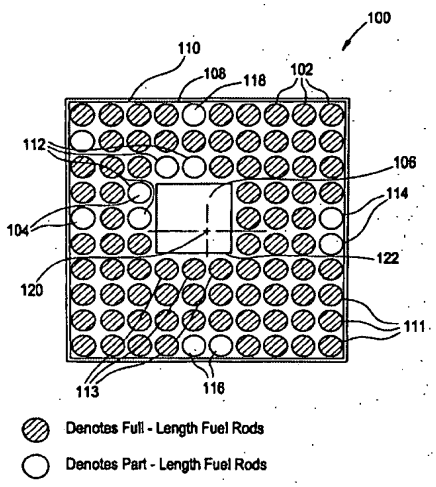
Independent Claim 31

Claim 31 recites "A fuel bundle for a boiling water reactor". AS described in paragraphs [0016] and [0021], an elevation view of a fuel bundle 10 is shown in FIG. 1, and a cross-sectional view of a fuel bundle 100 is depicted in FIG. 3.

Claim 31 further recites "a single, square-shaped water passage located off-center within a 10x10 fuel-rod matrix bounded by four sides of a generally square, hollow tube, the fuel rods including full-length and part-length fuel rods". As described in paragraph [0021], the single, square-shaped water passage 106 is located off of center 120 within a 10x10 matrix (FIG. 3) with four sides 110 of the bundle 100, the bundle 100 including full-length 102 and part-length 104 rods.

Claim 31 further recites "wherein the 10X10 fuel-rod matrix includes a first rod group comprising two pairs of part-length rods arranged on either side of a corner of the square water-passage, and a second rod group comprising two pairs of part-length rods and at least two non-paired part-length rods, each of the two pairs and the at least two non-paired part-length rods located in a corresponding outermost row or column of the matrix adjacent a corresponding side of the tube". AS described in paragraph [0022], FIG. 3 shows the 10x10 matrix which includes first rod groups 112 of part-length rods on either side of a corner of the water passage 106. As described in paragraph [0022], FIG. 3 also depicts the second rod groups of two pairs of part-length rods 114, 116 and two non-paired part-length rods 118 located in the outermost rows or columns (see the 26 rods located around the perimeter of the matrix) adjust to the tube sides 110.

FIG. 3



VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 24 and 26-29 are unpatentable under 35 U.S.C. §103(a) over Orii et al. (USP 6,735,267, hereafter "Orii") and further in view of Ueda et al. (USP 5,068,082, hereafter "Ueda") and Johansson et al. (USP 5,229,068, hereafter Johansson).

Whether claims 31-33 are unpatentable under 35 U.S.C. §103(a) over Orii et al. and Johansson et al.

VII. ARGUMENT

Claims 24 and 26-29 rise and fall together.

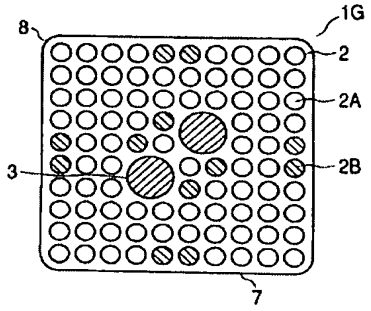
Claims 31-33 rise and fall together.

A. Claims 24, 26-29 and 31-33 are not rendered obvious under 35 U.S.C. §103(a) as being unpatentable over Orii et al. in view of Ueda et al. and Johansson et al.

1) Independent claims 24 & 28, and Dependent claim 26 & 27

The Examiner rejects claims 24 and 26-29 as being unpatentable over Orii et al. ("Orii") in view of Ueda et al. ("Ueda") and further in view of Johansson et al. ("Johansson"). The Examiner asserts that Orii teaches the basic inventive concept of independent claims 24 and 28 including a generally square fuel bundle having a pair of water passages with circular cross-sections located centrally or proximal center, a first part-length rod group including two pair of part-length fuel rod subsets in a mirror-image along the centerline located between the two water passages and a second part-length rod group including four pair of part-length rods located in the outermost rows of a 10x10 matrix adjacent to one of the four sides of the tube. The Examiner relies on FIG. 15 (see figure below) of Orii, to make this assertion[1].

FIG. 15



[1] See page 4, of the December 20, 2006 Office Action.

The Examiner cites Ueda, FIG. 19 (see figure below) and col. 12, lines 53-66, asserting that Ueda indicates that it is well-known in the art to provide certain groupings of part-length rods, and in particular 3-rod subgroups adjacent to a water passage[2]. The Examiner cites col. 2, lines 3-15 of Johansson[3], asserting that Johansson teaches that the addition of part length rods lowers the pressure drop and thereby improves the critical power of a fuel bundle. Also, the Examiner asserts that the inclusion of a third rod in Orii is no more than the duplication of parts with predictable and intended effects, such that a skilled artisan wishing to duplicate the effect of one of the part-length rods in a 2-rod subgroup.

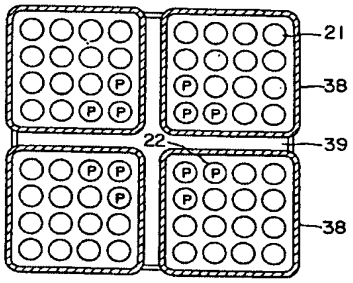


FIG. 19

With regards to Orii, the Examiner admits[4] that Orii does not teach part-length rod groups that include two groups of "*three part-length fuel rods in triangular orientation* with one rod of the subset closer to the longitudinal centerline between the two water passages than the other two rods of the subset" (recited in claim 24). Furthermore, Appellants do not find a suggestion in Orii that the orientation of the part-length rods in FIG. 15 (or the other embodiments depicted in Orii) is open to any degree of manipulation, as the Orii part-length rod orientation is governed by a specific set of conditional Equations, listed in the Abstract (and discussed throughout the patent). Orii does not teach or suggest the use of the part-length rods in order to trap neutrons in order to improve the reactor shutdown margin.

[2] See page 4, of the December 20, 2006 Office Action.
[3] See page 6, of the December 20, 2006 Office Action.
[4] See page 4 of the December 20, 2006 Office Action.

Rather, Orii cites as its main objective that the fuel assemblies containing part-length rods are capable of attaining allowable core stability *by increasing burn-up without increasing pressure loss* (col. 1, lines 54-58). Orii does not teach or suggest the use of part-length rods in order to assist in reactor shut-down, and Orii does not suggest the use of part-length rods to increase shut-down margin. The focus of Orii is to find part-length rod orientations that meet the conditional requirements of Equations 1-6, such that the fuel assembly burn-up is increased without increasing pressure drop. As stated in col. 13, lines 5-11, the FIG. 15 pattern of part-length rods satisfies the specific conditions expressed in Equations 1, 3, 4, 6, 11, and 15. These equations do not optimize shut-down margin, and the Examiner does not cite any portion of Orii that discusses such an attribute. The satisfaction of Equations 1, 3, 4, 6, 11 and 15 (as discussed in col. 13, lines 5-11) in order to arrive at the specific orientation of FIG. 15 in order to increase burn-up without increasing pressure drop, *appear similar* to the orientation of part-length rods in claim 24 by a product of nothing more than coincidence, as Orii is not optimizing or suggesting the improvement of shut-down margins, and shut-down margin is not a focus of Orii's conditional Equations.

With respect to Ueda, the Examiner's citation to FIG. 19 and col. 12, lines 53-66 of Ueda[5], is simply a general reference to 3-rod subgroups near water passages, where the 3-rod subgroups are full-length "interposed" rods (as shown for instance in FIGS. 2A and 59A), which may be filled with a significantly reduced level of fissile material in at least a portion of the fuel rod. As explained in the Abstract, Ueda also teaches embodiments using shorter-length rods (as shown for instance in FIGS. 21A, 22A, 25A and 57A). However, the specification and figures of Ueda indicate that the embodiment of FIG. 19 is an embodiment using full-length "interposed" rods 22, and not part-length rods (see description in col. 12,

[5] See page 4, of the December 20, 2006 Office Action.

lines 53-66). While other embodiments such as FIG. 25A of Ueda do use part-length rods, the FIG. 19 embodiment is specific to only "interposed" rods. Therefore, FIG. 19 suggests no more than the use of full-length 3-group rods 22, consisting of fissile-material that differs from conventional rods, which may be located near a water passage. Further, the FIG. 19 water passage is cruciform-shaped, and not "a pair of circular-shaped water passages", as recited in claim 24, making the relevance of FIG. 19 more attenuated. Also, the 3-rod groups in FIG. 19 are not "two subsets in a mirror-image relationship... between the two water passages", as recited in claim 24, as they are instead four 3-rod subgroups. Lastly, Ueda's FIG. 19 involves an 8x8 matrix, which differs from the "10x10 matrix" recited in Appellants' claim 24. While the Examiner has explained that Ueda is not being cited in order to teach the part-length rod orientation of claim 24, it is the Appellants' assertion that the part-length rod orientation of FIG. 19 differs so significantly from that of claim 24 (with a very different water passage orientation, twice the number of 3-rod subgroups, and an 8x8 matrix as opposed to 10x10) that the general assertion that Ueda teaches "3-rod subgroups" carries little weight. Furthermore, because FIG. 19 is teaching the use of full-length "interposed" rods, as opposed to part-length rods, it is Appellants' belief that FIG. 19 is altogether inapplicable to claim 24 and the orientation of "*part-length*" rod groups.

The Examiner cites FIG. 25A of Ueda[6] in order to support the assertion that Ueda teaches the use of 3-rod subgroups of part-length rods. While Appellants' do agree that FIG. 25A discloses the use of part-length rods (unlike FIG. 19, which specifies only "interposed" rods), Appellants draw the Examiner's attention to FIGS. 25B, 25C and 25D which are cross-sectional views at various elevations of FIG. 25A (as explained in col. 14, lines 41-46). It is clear from FIGS. 25B, 25C and 25D that the cruciform orientation of the 16 part-length rods

[6] See page 5 of the December 20, 2006 Office Action.

depicted in FIGS. 25A – 25D provides no reasonable relevance to the teaching or suggestion of "three part-length fuel rod" subgroups, as recited in Appellants' claim 24.

Assuming, *arguendo*, that Orii could be combined with Ueda (Appellants do not admit or even believe that these references may be combined), the combination of these references would still not teach claim 24, as neither of these references teach "a first part-length rod group including two subsets in a mirror-image relationship along the centerline between the two water passages, each subset further comprising three part-length fuel rods in a triangular orientation with one rod of the subset closer to the longitudinal centerline between the two water passages than the other two rods of the subset".

Appellant asserts that it is improper to combine Orii with Ueda. A combination of references that destroys the intended function of one of the references, is not proper[7]. Orii places great weight on the satisfaction of the conditional Equations in order to arrive at a part-length rod orientation. The combination of Orii with a reference that may suggest the use of 3-rod groups rather than 2-rod groups[8], or the combination of Orii with a reference that may suggest the benefits of part-length rods[9], generally, is in essence destroying the specific teachings of Orii. Specifically, the Examiner relies on disregarding Orii's Equations, and instead allowing for the mathematically derived Orii part-length rod orientations to be altered using only the more general principles of Ueda. Appellant asserts that such casual manipulation of rigorously derived orientations using only relaxed teachings would render the Orii reference inoperable for its intended purpose, and is therefore not proper under 35 U.S.C. §103.

[7] In re Gordon, 733 F.2d 900, 902 (Fed. Cir. 1984).
[8] See the Examiner's assertion in introducing Ueda, on page 4 of the December 20, 2006 Office Action.
[9] See the Examiner's assertion in introducing Johansson, on page 5 of the December 20, 2006 Office Action.

With respect to Johansson, the Examiner cites col. 2, lines 3-15 in making the assertion that Johansson teaches the addition of part-length rods which lowers pressure drop and improves critical power[10]. Appellant asserts that the addition of Johansson's with the Orii and Ueda combination also causes Orii to be inoperable for its intended purpose. The Examiner's suggested combination of Johansson with Orii and Ueda would violate the Equations that Orii mandates must be met. As such, combining Johansson with Orii and Ueda would destroy Orii for its intended purpose. This is an impermissible and non-obvious combination, and therefore claim 24 cannot be rendered obvious to a person of ordinary skill in the art.

Additionally, the Examiner appears to have used impermissible hindsight reconstruction to reject claim 24. By the Examiner's own admission, he is "not attempting to combine ***every feature*** of this embodiment with the primary reference, but rather has gleaned relevant teachings regarding the configuration and position of the 3-rod subgroup"[11]. The Examiner seems to have used Appellants' FIG. 2 as a blueprint, selected a prior art fuel assembly (Orii, FIG. 15) as the main structural device, and then searched other prior art for the missing elements (two 3-rod subgroups near the water passages) without identifying or discussing a motivation to combine.

The Federal Circuit has noted that the PTO and the courts "cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention," In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1780, 1783 (Fed. Cir. 1988), and that the best defense against hindsight-based obviousness analysis is the rigorous application of the requirement for a showing of a teaching or motivation to combine the prior art references. Combining prior art references without evidence of such a suggestion,

[10] See Page 5 of the December 20, 2006 Office Action.
[11] See page 8 and 9 of the December 20, 2006 Office Action.

teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight. Dembiczak, 50 USPQ2d at 1617.

In combining the teachings of Ueda and Johansson with Orii, the Examiner has argued that inclusion of a third part-length rod in the Orii configuration is "no more than the duplication of parts with predictable and intended effects."[12] Appellants again draw the Examiner's attention to col. 13, lines 5-11 of Orii, which explain that the exact configuration of Orii's FIG. 15 embodiment satisfies Equations 1, 3, 4, 6, 11, and 15. As explained in col. 13, lines 43-45, the ratio of part-length rods to full-length rods is just one of the carefully selected attributes of FIG. 15. Orii continues, by explaining that the FIG. 15 embodiment may be in essence duplicated, with a similar embodiment as shown in FIG. 17 and discussed in col. 14, lines 7-16. Orii is clear that the positions of the part-length rods in FIG. 17 need to be arranged just as depicted in FIG. 17 (col. 14, lines 7-16). It should be noted that the specifically arranged part-length rod pattern of FIG. 17 does not teach Appellant's claim 24. Orii continues to teach other part-length rod orientations, for instance those shown in FIGS. 18 and 20 (and discussed in col. 14, lines 18-52 and col. 15, lines 23-34), neither of which teach Appellant's claim 24. In each case discussed above, Orii specifies that the conditional Equations must be met in order to provide for the specific embodiments depicted in the figures. At no time does Orii suggest that other similar orientations involving part-length rods may be overtly manipulated or attempted, such that a skilled artisan would be motivated to openly experiment with placing more (or less) part-length rods within orientations already depicted within the provided figures. Orii places great emphasis on all rod orientations meeting the specific conditional Equations 1-6 listed in the Abstract and discussed throughout

[12] See page 4 of the December 20, 2006 Office Action.

the reference. For at least these reasons, it is apparent that simply adding (or subtracting) more part-length rods to Orii's FIG. 15 would not be merely duplicating parts with a predictable and intended effect, but instead would disrupt the specifically calibrated orientation of part-length rods that meet the particular conditional Equations taught by Orii.

2) Independent Claim 28

With regards to independent claim 28, the same arguments can be made against the cited art which does not teach either singly, or in combination, "*two 3-rod subsets* consisting of part-length rods in a mirror image relationship with one another along the longitudinal centerline between the two water passages, each 3-rod subset configured in a triangular orientation and directly adjacent to the pair of water passages".

For at least the reasons stated above, Appellants believe independent claims 24 and 28 would not have been obvious to a person of ordinary skill in the art, such that these claims are believed to be patentable. For at least the same reasons, Appellants believe dependent claims 26-27 and 29 are also patentable.

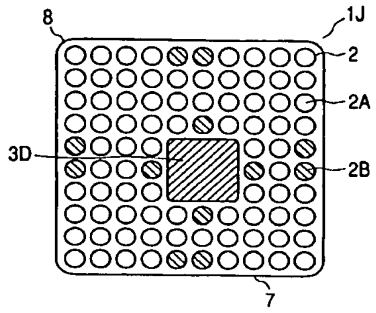
B. Claims 31-33 are not rendered obvious under 35 U.S.C. §103(a) as being unpatentable over Orii et al. in view of Johansson et al.

The Examiner rejects claims 31-33 as being unpatentable over Orii et al. ("Orii") in view of Johansson et al. ("Johansson"). The Examiner points to Orii as the primary reference cited against these claims (see FIG. 20, below). The Examiner asserts that Johansson teaches that "the addition of part length rods lowers the pressure drop, thereby improving critical power,"[13] which the Examiner explains provides the requisite motivation for a skilled artisan

[13] See page 5 of the December 20, 2006 Office Action.

to modify Orii's orientation such that two of the pairs of part-length rods near the tube sides may become lone part-length rods (rather than a pair of rods), and the four part-length rods on each side of the water passage may become two pairs, located on a corner of the water passage.

FIG. 20



Appellants assert that neither Orii or Johansson, either singly or in combination with each other, teach or suggest "a first rod group comprising two pairs of part-length rods arranged on either side of a corner of the square water-passage, and a second rod group comprising two pairs of part-length rods and at least two non-paired part-length rods, each of the two pairs and the at least two non-paired part-length rods located in a corresponding outermost row or column of the matrix adjacent a corresponding side of the tube". FIG. 20 of Orii does not teach two single part-length rods and two pairs of part-length rods along the sides of the tube, but rather, Orii teaches four pairs of part-length rods along the sides of the tube. Furthermore, FIG. 20 does not teach two pair of part-length rods each located near a corner of the water passage, but rather Orii teaches 4 separate part-length rods located equidistant along the 4 sides of the water passage. As stated explicitly in col. 15, lines 23-34,

Orii arrives at the specific part-length rod orientation of FIG. 20 (Orii explains in col. 15, lines 23-34 that this orientation is similar to the embodiment of FIG. 18) only by meeting the conditions of Equation 1, 4, 8, 10, 16 and 17 (see discussion in col. 14, lines 18-52, relating to FIG. 18). Therefore, Orii is not suggesting that the use of part-length rods is open to free movement of the part-length rod locations (or the addition or subtraction of part-length rods, generally), but rather, Orii is teaching the specific placement of these part-length rods as depicted in FIG. 18 and FIG. 20, based on the conditional Equations being met. Furthermore, Orii's main focus is to increase burn-up without increasing pressure drop and therefore Orii does not teach or suggest the use of part-length rods to increase shut-down margin, for at least the reasons stated above related to claim 24.

The Examiner's suggested combination of Johansson with Orii would violate the Equations that Orii mandates must be met. As such, combining Johansson with Orii would destroy Orii for its intended purpose. As discussed above with respect to claim 24, this is an impermissible and non-obvious combination. Claim 31, therefore, cannot be rendered obvious to a person of ordinary skill in the art by combining Orii in view of Johansson.

For at least the reasons stated above, Appellants believe independent claim 31 to be patentable. For at least the same reasons, Appellants believe that dependent claims 32 and 33 are also patentable.

VIII. CONCLUSION

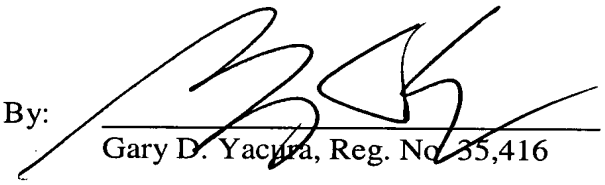
Appellants respectfully request the Board to reverse the Examiner's rejection of claims 24, 26-29 and 31-33 and allow each of these claims.

Pursuant to 37 C.F.R. § 1.17 and § 1.136(a), Appellants respectfully petition for a one (1) month extension of time for filing a response in connection with the present application, and the required fee of $120.00 is attached.

The Commissioner is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKEY, & PIERCE, P.L.C.

By: 

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IX. CLAIMS APPENDIX:

24. A fuel bundle for a boiling water reactor, comprising:

a generally square, hollow tube having four sides which are configured as sides of the bundle,

a pair of circular-shaped water passages located adjacent to a longitudinal centerline of the tube so as to extend centrally through the tube, the pair of water passages supported by one or more rod supports,

a plurality of fuel rods arranged in a 10x10 matrix and including full-length rods and part-length rods, the part-length rods further comprising:

a first part-length rod group including two subsets in a mirror-image relationship along the centerline between the two water passages, each subset further comprising three part-length fuel rods in a triangular orientation with one rod of the subset closer to the longitudinal centerline between the two water passages than the other two rods of the subset and directly adjacent to the other two rods of the subset, and

a second part-length rod group including four pairs of part-length rods, each part-length rod pair centrally located in the outermost row or column of the 10x10 matrix adjacent a corresponding one of the four sides of the tube.

26. The fuel bundle of claim 24, wherein a plurality of voids are formed above upper ends of each of the part-length fuel rods to the top of the fuel bundle, and wherein the voids filled with water are configured to trap neutrons for improving a shutdown margin for the boiling water reactor.

27. The fuel bundle of claim 24, wherein there are a total of 14 part-length rods therein.

28. A fuel bundle for a boiling water reactor, comprising:

a pair of centrally located, circular-shaped water passages arranged on either side of a longitudinal centerline of the bundle within a 10X10 fuel-rod matrix bounded by four sides of a generally square, hollow tube, the fuel rods including full-length and part-length fuel rods,

wherein the 10X10 fuel-rod matrix includes two 3-rod subsets consisting of part-length rods in a mirror image relationship with one another along the longitudinal centerline between the two water passages, each 3-rod subset configured in a triangular orientation and directly adjacent to the pair of water passages such that one rod of the 3-rod subset is closer to the centerline than the other two rods and directly adjacent to the other two rods, and comprising eight additional part-length rods arranged in four pairs, each pair centrally located on an outermost row or column of the matrix nearest a corresponding one of the tube sides.

29. The fuel bundle of claim 28, wherein a plurality of voids are formed above upper ends of each of the part-length fuel rods to the top of the fuel bundle, and wherein the voids filled with water are configured to trap neutrons for improving a shutdown margin for the boiling water reactor.

31. A fuel bundle for a boiling water reactor, comprising:

a single, square-shaped water passage located off-center within a 10x10 fuel-rod matrix bounded by four sides of a generally square, hollow tube, the fuel rods including full-length and part-length fuel rods,

wherein the 10X10 fuel-rod matrix includes a first rod group comprising two pairs of part-length rods arranged on either side of a corner of the square water-passage, and a second rod group comprising two pairs of part-length rods and at least two non-paired part-length rods, each of the two pairs and the at least two non-paired part-length rods located in a corresponding outermost row or column of the matrix adjacent a corresponding side of the tube.

32. The fuel bundle of claim 31, wherein a plurality of voids are formed above upper ends of each of the part-length fuel rods to the top of the fuel bundle, and wherein the voids filled with water are configured to trap neutrons for improving a shutdown margin for the boiling water reactor.

33. The fuel bundle of claim 31, wherein there are a total of eleven part-length rods within the 10X10 matrix.

X. EVIDENCE APPENDIX:

As no evidence was submitted and relied upon in this Appeal, this Appendix contains no evidence pursuant to 37 C.F.R. §41.37(c)(1)(ix).

XI. RELATED PROCEEDINGS APPENDIX:

Copies of a decision rendered by a court or the Board regarding the related proceeding stated above do not exist, as no decision has been made at this time relating to that proceeding. Therefore, no additional information is being supplied in an Appendix pursuant to 41.37(c)(1)(x).